WHAT IS CLAIMED IS:

1. An apparatus to control displacement of a body spaced-apart from a surface, said apparatus comprising:

a flexure system;

a body having a neutral plane; and

an actuation system coupled to said flexure system and said body to obtain a desired spatial orientation between said neutral plane and said surface.

2. The apparatus as recited in claim 1 wherein said desired spatial orientation includes arranging said neutral plane to extend parallel to said surface.

3. The apparatus as recited in claim 1 wherein said desired spatial orientation includes arranging said neutral plane so that a 50 nanometer region of a 25 millimeter area of said neutral planes extends parallel to said surface.

4. The apparatus as recited in claim 1 wherein said desired spatial orientation includes arranging said neutral plane so that a 100 nanometer region of a 25 millimeter area of said neutral planes extends parallel to said surface.

5. The apparatus as recited in claim 1 wherein said desired spatial orientation includes arranging said neutral plane so that a 250 nanometer region of a 25 millimeter area of said neutral planes extends parallel to said surface.

6. The apparatus as recited in claim 1 wherein said body is coupled to said actuation system to move with respect to a plurality of axes and said actuation system is configured to selectively constrain movement of said body along a subset of said plurality of axes.

7. The apparatus as recited in claim 1 wherein said body is coupled to said actuation system to move with respect to a plurality of axes and said actuation system is configured to selectively constrain movement of said body along a subset of said plurality of axes, with said subset being coplanar with said body.

8. The apparatus as recited in claim 1 wherein said body is coupled to said actuation system to move with respect to a plurality of axes and said actuation system is configured to selectively constrain movement of said body along a subset of said plurality of axes, with said subset of axes including two substantially orthogonal axes.

9. The apparatus as recited in claim 1 wherein said body is coupled to said actuation system to move with respect to a plurality of axes and said actuation system is configured to selectively constrain movement of said body along a subset of said plurality of axes, with said actuation system providing resistance to translational displacement of said body with respect to a subgroup of said subset of axes, while allowing relatively free translational displacement with respect to axes outside of said subset, and resistance to rotational displacement of said body with respect to a sub-portion of said subgroup,

while allowing relatively free rotational displacement of said body with respect to axes outside of said sub-portion.

10. The apparatus as recited in claim 9 wherein said subset of axes includes two substantially orthogonal axes and said subgroup includes an additional axis extending substantially orthogonally to said two substantially orthogonal axes.

11. The apparatus as recited in claim 9 wherein said subgroup extends normal to a surface of said body.

12. The apparatus as recited in claim 1 wherein said first and second flexure members each includes a mount, a pair of spaced-apart braces, a first flexure arm pivotally connected between said mount and one of said pair of spaced-apart braces, and a second flexure arm pivotally connected between said mount and one of said pair of spaced-apart braces disposed opposite to said first flexure arm.

13. The apparatus as recited in claim 1 further including a flexure ring, a base plate and a force sensor connected between said flexure ring and said base plate with said flexure system being connected to said flexure ring.

14. The apparatus as recited in claim 13 wherein said actuation system further includes a plurality of actuators to control displacement of said body.

15. The apparatus as recited in claim 1 wherein said first and second flexure members are coupled together to define a flexure system having eight joints with said joints being spaced-apart from a pivot point defined by the intersection of said first axis and said second axis.

16. An apparatus to control displacement of a body spaced-apart from a surface, said apparatus comprising:

a flexure system having first flexure and second flexure members;

a body; and

an actuation system coupled to said flexure system with said body being coupled to said flexure system to move with respect to a plurality of axes with said actuation system being configured to selectively constrain movement of said body along a subset of said plurality of axes.

17. The apparatus as recited in claim 16 wherein said actuation system provides resistance to movement of said body with respect to said subset, while allowing relatively free movement with respect to axes outside of said subset.

18. The apparatus as recited in claim 16 wherein said subset is coplanar with said body.

19. The apparatus as recited in claim 16 wherein said subset of axes includes two orthogonal axes.

20. The apparatus as recited in claim 16 wherein said actuation system provides resistance to translational displacement of said body with respect to a subgroup of

said subset of axes, while allowing relatively free translational displacement with respect to axes outside of said subset, and resistance to rotational displacement of said body with respect to a sub-portion of said subgroup, while allowing relatively free rotational displacement of said body with respect to axes outside of said sub-portion.

21. The apparatus as recited in claim 20 wherein said subset of axes includes two substantially orthogonal axes and said subgroup includes an additional axis extending substantially orthogonally to said two orthogonal axes.

22. The apparatus as recited in claim 20 wherein said subgroup extends normal to a surface of said body.

23. The apparatus as recited in claim 16 wherein said first and second flexure members each includes a mount, a pair of spaced-apart braces, a first flexure arm pivotally connected between said mount and one of said pair of spaced-apart braces, and a second flexure arm pivotally connected between said mount and one of said pair of spaced-apart braces disposed opposite to said first flexure arm.

24. The apparatus as recited in claim 16 further including a flexure ring, a base plate and a force sensor connected between said flexure ring and said base plate with said flexure system being connected to said flexure ring.

25. The apparatus as recited in claim 24 wherein said actuation system further includes a plurality of actuators to control displacement of said body.

26. The apparatus as recited in claim 16 wherein said first and second flexure members are coupled together to define a flexure system having eight joints with said joints being spaced-apart from a pivot point defined by the intersection of said first axis and said second axis.

27. An apparatus to control displacement of a body spaced-apart from a surface, said apparatus comprising:

a flexure system;

a body; and

an actuation system coupled to said flexure system with said body being coupled to said flexure system to move with respect to a plurality of axes with said actuation system being configured to selectively constrain translational displacement of said body with respect to a subset of said plurality of axes and to constrain rotational displacement of said body with respect to a subgroup of said plurality of axes.

28. The apparatus as recited in claim 27 wherein each of the axes associated with said subset differs from each of the axes associated with said subgroup.

29. The apparatus as recited in claim 27 wherein said actuation system provides resistance to translational displacement of said body with respect to said subset, while allowing relatively free translational displacement

with respect to axes outside of said subset, and resistance to rotational displacement of said body with respect to a sub-portion of said subgroup, while allowing relatively free rotational displacement of said body with respect to axes outside of said sub-portion.

30. The apparatus as recited in claim 27 wherein the axes of said subset are coplanar with said body.

31. The apparatus as recited in claim 27 wherein said subset of axes includes two substantially orthogonal axes.

32. The apparatus as recited in claim 27 wherein said subset of axes includes two substantially orthogonal axes and said subgroup includes an additional axis extending substantially orthogonally to said two substantially orthogonal axes.

33. The apparatus as recited in claim 32 wherein said subgroup extends normal to a surface of said body.

34. The apparatus as recited in claim 27 wherein said flexure system further includes first and second flexure members each having a mount, a pair of spaced-apart braces, a first flexure arm pivotally connected between said mount and one of said pair of spaced-apart braces, and a second flexure arm pivotally connected between said mount and one of said pair of spaced-apart braces disposed opposite to said first flexure arm.

35. The apparatus as recited in claim 27 further including a flexure ring, a base plate and a force sensor connected between said flexure ring and said base plate with said first and second flexure members being connected to said flexure ring.

36. The apparatus as recited in claim 35 wherein said actuation system further includes a plurality of actuators connected to said base plate.

37. An apparatus to control displacement of a body spaced-apart from a surface, said apparatus comprising:

a flexure system having first and second flexure members with said first and second flexure members each including a mount, a pair of spaced-apart braces, a first flexure arm pivotally connected between said mount and one of said pair of spaced-apart braces, and a second flexure arm pivotally connected between said mount and one of said pair of spaced-apart braces disposed opposite to said first flexure arm;

a body; and

an actuation system coupled to said flexure system with said body being coupled to said flexure system to move about a plurality of axes with said actuation system being configured to selectively constrain translational displacement of said body with respect to a subset of said plurality of axes and to constrain rotational displacement of said body with respect to a subgroup of said plurality of axes with said subset of axes including two substantially orthogonal axes and said subgroup including

an additional axis extending substantially orthogonally to said two substantially orthogonal axes.

38. The apparatus as recited in claim 37 wherein said actuation system provides resistance to translational displacement of said body with respect to said subset, while allowing relatively free translational displacement with respect to axes outside of said subset, and resistance to rotational displacement of said body with respect to a sub-portion of said subgroup, while allowing relatively free rotational displacement of said body with respect to axes outside of said sub-portion.

39. The apparatus as recited in claim 37 wherein the axes of said subset are coplanar with said body.

40. The apparatus as recited in claim 37 wherein the axes associated with said subgroup extend normal to a surface of said body.

41. The apparatus as recited in claim 37 wherein each of the axes associated with said subset differs from each of the axes associated with said subgroup.

42. The apparatus as recited in claim 37 further including a flexure ring, a base plate and a force sensor connected between said flexure ring and said base plate with said first and second flexure members being connected to said flexure ring.

43. The apparatus as recited in claim 42 wherein said actuation system further includes a plurality of actuators connected to said base plate.